F. Tavani and Associates, Inc.
Traffic Engineering and Planning

248 Beech Hill Road • Wynnewood • PA • 19096 • (215) 625-3821 Phone • (484) 792-9495 Fax
www.FTAVANIASSOCIATES.com

20 April 2021

Henry F. O'Reilly III
BESSH LLC
30 W Highland Avenue
Philadelphia, PA 19118

VIA EMAIL ONLY

RE: Traffic Engineering Investigations of 8 Townhouses at 30 W Highland Avenue, Philadelphia, Pennsylvania

FTA Job # 221-012

Mr. O'Reilly:

F. Tavani and Associates, Inc. (FTA) has conducted traffic engineering investigations for the above-referenced project in Chestnut Hill. The site is an existing 7,000 SF office building which I understand is fully occupied by E. B. O'Reilly – HVAC Design, Construction, & Service Experts. The project includes a proposal to raze the existing building and replace it with 8 residential townhomes. FTA's efforts were focused on the potential trip generation (traffic) impact the proposal may have on the community.

TRIP GENERATION

Traffic engineers most often cite the Institute of Transportation Engineers (ITE) publication, Trip Generation Manual (10th edition) when estimating site traffic. The publication has been in print for decades and is essentially a compendium of regression analyses based on real-world, empirical data at existing land uses. The traffic engineer is tasked with identifying the data in the publication which is the best representation of a proposed development. In this case both office and residential site traffic estimates were based on available land use codes (LUC) 710 (General Office) and 220 (Attached Multifamily Housing). ITE's offered average weekday daily and commuter peak hour trip generation rates and resultant trips for townhomes are summarized in the next two tables.

TABLE 1 – TRIP GENERATION RATES, TOWNHOMES

Land Use	ITE #	Time Period	Equations/ Rates	Directional Splits	
				Enter %	P-By %
Multifamily Housing – Low Rise	220	Average Weekday	T = 7.32(X)	50%	0%
		A.M. Peak Hour	T = 0.46(X)	23%	0%
		P.M. Peak Hour	Ln (T) = 0.89(X) – 0.02	63%	0%

T = number of site-generated vehicular trips X = independent variable (dwelling units)

TABLE 2 –TRIPS, TOWNHOMES

Description	Total New Trips		
	Total	Enter	Exit
Weekday Daily	60	30	30
Weekday AM	4	1	3
Weekday PM	6	4	2

As shown, the proposed 8 townhouses will generate about 60 trips per day about 6 (or fewer) trips during commuter peak hours, per ITE. Note that these investigations were carried out using the number of homes as a variable in the trip generation models.

The question becomes "is this more or less traffic than the existing use?" There are two ways to trip generate for the existing use: 1) investigate ITE estimates, for consistency with the residential investigations, using two different variables or 2) review observational data you have collected at your business. In the case of the former, ITE's offered average weekday daily and commuter peak hour trip generation rates and resultant trips for office space are summarized in the next two tables.

TABLE 3 – TRIP GENERATION RATES, OFFICE

Land Use	ITE #	Time Period	Equations/ Rates	Directional Splits	
				Enter %	P-By %
General Office	710	Average Weekday	Ln (T) = 0.97(X) + 2.50	50%	0%
		A.M. Peak Hour	T = 1.16(X)	86%	0%
		P.M. Peak Hour	T = 1.15(X)	16%	0%

T = number of site-generated vehicular trips X = independent variable (1000's of square feet [KSF] of Gross Floor Area [GFA])

TABLE 4 –TRIPS, OFFICE

Description	Total New Trips		
	Total	Enter	Exit
Weekday Daily	80	40	40
Weekday AM	8	7	1
Weekday PM	8	1	7

As shown, the existing 7 KSF of office will generate about 80 trips per day and about 8 trips during commuter peak hours, per ITE. Thus the trip generation of the proposed townhomes is about 25% less (daily) than the existing office, per this ITE method. Note that these investigations were carried out using KSF of GFA as a variable in the trip generation models. It is also possible to trip generate for office space using number of employees as the variable. Per our discussions, E. B. O'Reilly currently employs about 30 persons. Using that variable yields ITE trip generation estimates as follows:

TABLE 5 – TRIP GENERATION RATES, OFFICE

Land Use	ITE #	Time Period	Equations/ Rates	Directional Splits	
				Enter %	P-By %
General Office	710	Average Weekday	T = 3.28(X)	50%	0%
		A.M. Peak Hour	T = 0.37(X)	83%	0%
		P.M. Peak Hour	T = 0.40(X)	20%	0%

T = number of site-generated vehicular trips X = independent variable (employees)

TABLE 6 –TRIPS, OFFICE

Description	Total New Trips		
	Total	Enter	Exit
Weekday Daily	98	49	49
Weekday AM	11	9	2
Weekday PM	12	2	10

As shown – using number of employees as the variable – the existing 7 KSF of office will generate about 98 trips per day and about 11 or 12 trips during commuter peak hours, per ITE. Thus the trip generation of the proposed townhomes is about 39% less (daily) than the existing office, per this ITE method.

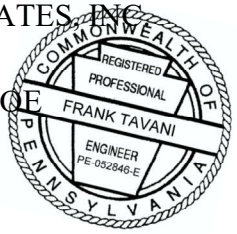
Finally, I understand that you have made your own observations of traffic at 30 W. Highland Avenue by watching CCTV recordings of driveway activity at your site over entire typical weekday(s) to formulate your own estimate of daily traffic. Per those recordings, you believe your site currently generates about 70 trips per day, which is less than ITE estimates for your office, but still more than ITE estimates for the proposed townhomes.

CONCLUSIONS

The currently-proposed plan is modest in scale and will generate relatively little new traffic. In fact, the amount of new traffic which will be added to area roadways will be less than traffic currently generated by the existing office building, which will be removed as part of the project. The project will not meaningfully impact intersection performance in the study area. If anything, it should modestly *improve* traffic conditions. I say this because, in terms of daily traffic, the project will result in about 32% less traffic in the neighborhood as compared to the existing condition. I hope this has been helpful. Please let me know if I can answer any questions.

Thank you,
F. TAVANI AND ASSOCIATES, INC.

FRANK TAVANI, P.E., PTOE
Principal



attachments

cc: Steve Bertil, Esq.

Land Use: 220
Multifamily Housing (Low-Rise)

Description

Low-rise multifamily housing includes apartments, townhouses, and condominiums located within the same building with at least three other dwelling units and that have one or two levels (floors). Multifamily housing (mid-rise) (Land Use 221), multifamily housing (high-rise) (Land Use 222), and off-campus student apartment (Land Use 225) are related land uses.

Additional Data

In prior editions of *Trip Generation Manual*, the low-rise multifamily housing sites were further divided into rental and condominium categories. An investigation of vehicle trip data found no clear differences in trip making patterns between the rental and condominium sites within the ITE database. As more data are compiled for future editions, this land use classification can be reinvestigated.

For the three sites for which both the number of residents and the number of occupied dwelling units were available, there were an average of 2.72 residents per occupied dwelling unit.

For the two sites for which the numbers of both total dwelling units and occupied dwelling units were available, an average of 96.2 percent of the total dwelling units were occupied.

This land use included data from a wide variety of units with different sizes, price ranges, locations, and ages. Consequently, there was a wide variation in trips generated within this category. Other factors, such as geographic location and type of adjacent and nearby development, may also have had an effect on the site trip generation.

Time-of-day distribution data for this land use are presented in Appendix A. For the 10 general urban/suburban sites with data, the overall highest vehicle volumes during the AM and PM on a weekday were counted between 7:15 and 8:15 a.m. and 4:45 and 5:45 p.m., respectively. For the one site with Saturday data, the overall highest vehicle volume was counted between 9:45 and 10:45 a.m. For the one site with Sunday data, the overall highest vehicle volume was counted between 11:45 a.m. and 12:45 p.m.

For the one dense multi-use urban site with 24-hour count data, the overall highest vehicle volumes during the AM and PM on a weekday were counted between 7:00 and 8:00 a.m. and 6:15 and 7:15 p.m., respectively.

For the three sites for which data were provided for both occupied dwelling units and residents, there was an average of 2.72 residents per occupied dwelling unit.

The average numbers of person trips per vehicle trip at the five general urban/suburban sites at which both person trip and vehicle trip data were collected were as follows:

- 1.13 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 7 and 9 a.m.
- 1.21 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 4 and 6 p.m.

The sites were surveyed in the 1980s, the 1990s, the 2000s, and the 2010s in British Columbia (CAN), California, District of Columbia, Florida, Georgia, Illinois, Indiana, Maine, Maryland, Minnesota, New Jersey, New York, Ontario, Oregon, Pennsylvania, South Dakota, Tennessee, Texas, Utah, Virginia, and Washington.

It is expected that the number of bedrooms and number of residents are likely correlated to the number of trips generated by a residential site. Many of the studies included in this land use did not indicate the total number of bedrooms. To assist in the future analysis of this land use, it is important that this information be collected and included in trip generation data submissions.

Source Numbers

168, 187, 188, 204, 211, 300, 305, 306, 319, 320, 321, 357, 390, 412, 418, 525, 530, 571, 579, 583, 864, 868, 869, 870, 896, 903, 918, 946, 947, 948, 951

Multifamily Housing (Low-Rise)
(220)

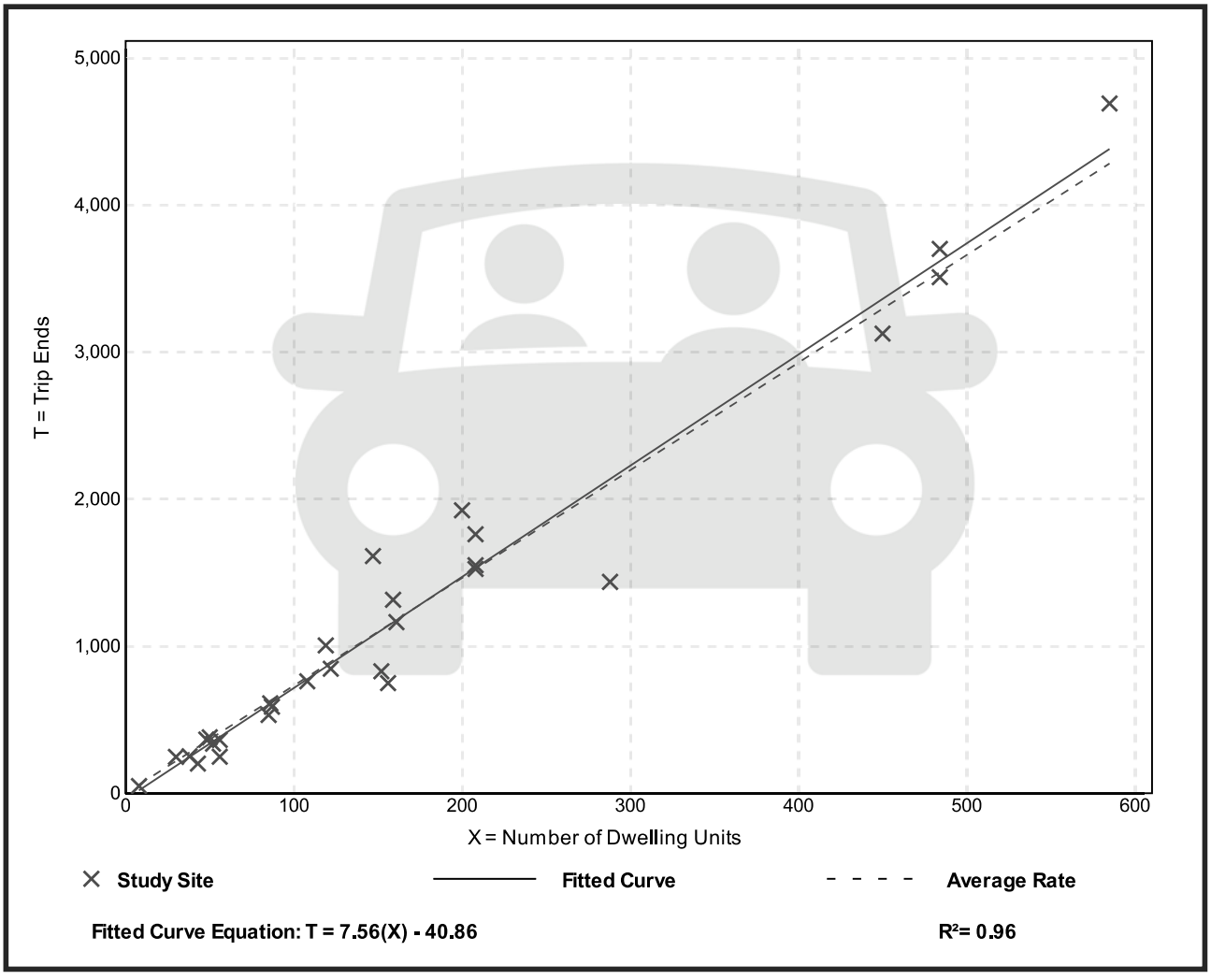
Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday**

Setting/Location: **General Urban/Suburban**
Number of Studies: 29
Avg. Num. of Dwelling Units: 168
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
7.32	4.45 - 10.97	1.31

Data Plot and Equation



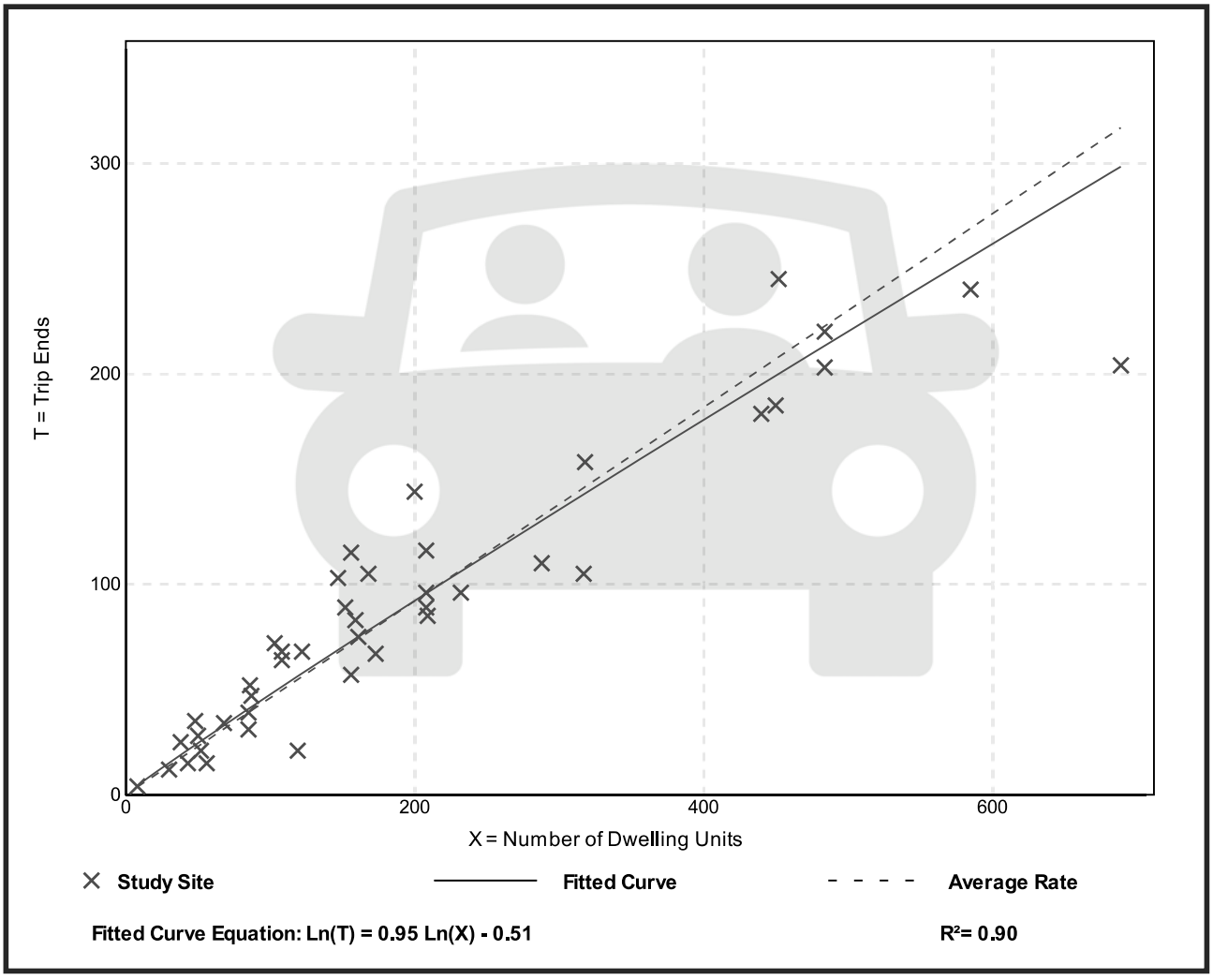
Multifamily Housing (Low-Rise)
(220)

Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 42
Avg. Num. of Dwelling Units: 199
Directional Distribution: 23% entering, 77% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.46	0.18 - 0.74	0.12

Data Plot and Equation



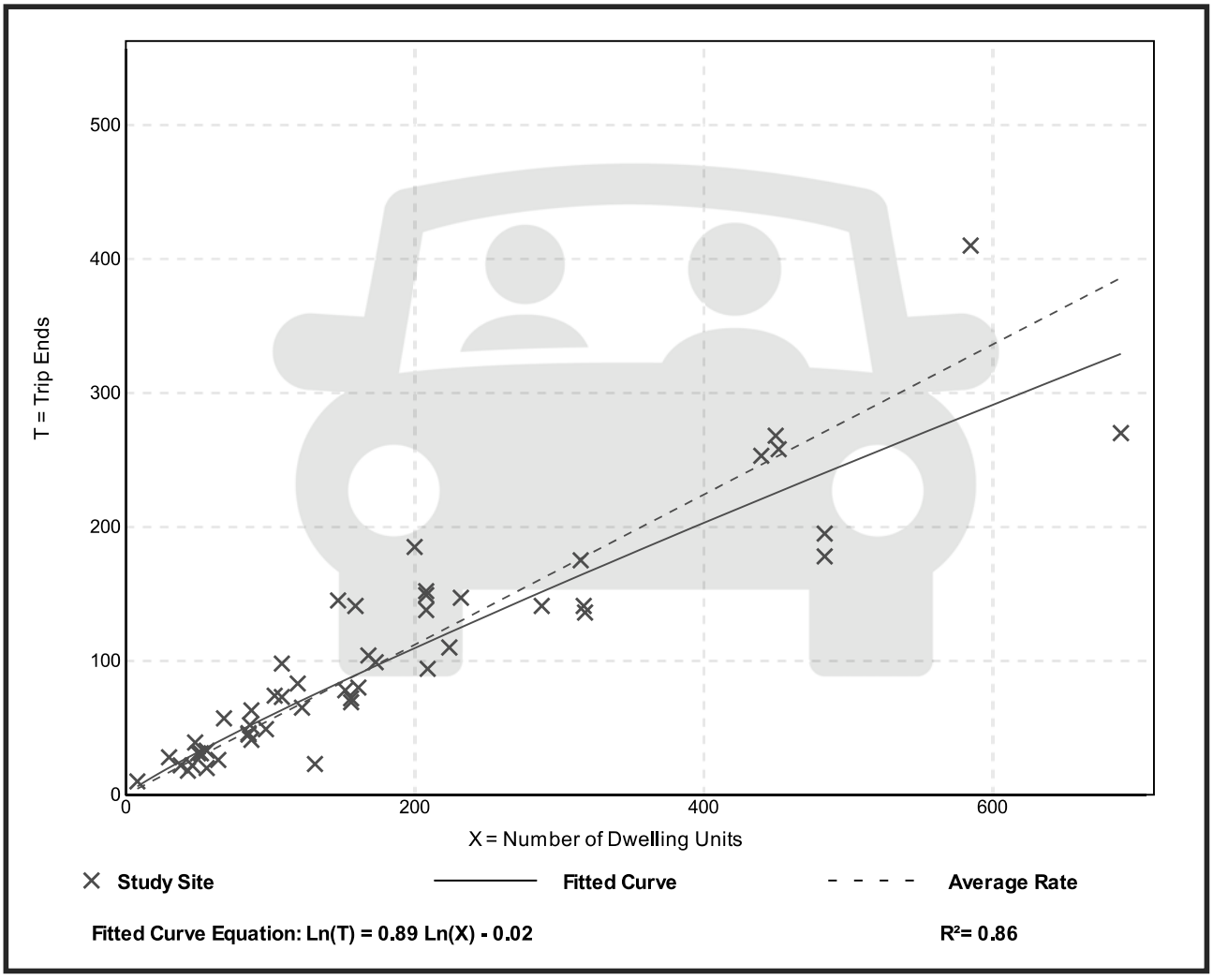
Multifamily Housing (Low-Rise)
(220)

Vehicle Trip Ends vs:	**Dwelling Units**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 4 and 6 p.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	50
Avg. Num. of Dwelling Units:	187
Directional Distribution:	63% entering, 37% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.56	0.18 - 1.25	0.16

Data Plot and Equation



Land Use: 710
General Office Building

Description

A general office building houses multiple tenants; it is a location where affairs of businesses, commercial or industrial organizations, or professional persons or firms are conducted. An office building or buildings may contain a mixture of tenants including professional services, insurance companies, investment brokers, and tenant services, such as a bank or savings and loan institution, a restaurant, or cafeteria and service retail facilities. A general office building with a gross floor area of 5,000 square feet or less is classified as a small office building (Land Use 712). Corporate headquarters building (Land Use 714), single tenant office building (Land Use 715), office park (Land Use 750), research and development center (Land Use 760), and business park (Land Use 770) are additional related uses.

If information is known about individual buildings, it is suggested that the general office building category be used rather than office parks when estimating trip generation for one or more office buildings in a single development. The office park category is more general and should be used when a breakdown of individual or different uses is not known. If the general office building category is used and if additional buildings, such as banks, restaurants, or retail stores are included in the development, the development should be treated as a multiuse project. On the other hand, if the office park category is used, internal trips are already reflected in the data and do not need to be considered.

When the buildings are interrelated (defined by shared parking facilities or the ability to easily walk between buildings) or house one tenant, it is suggested that the total area or employment of all the buildings be used for calculating the trip generation. When the individual buildings are isolated and not related to one another, it is suggested that trip generation be calculated for each building separately and then summed.

Additional Data

The average building occupancy varied considerably within the studies for which occupancy data were provided. The reported occupied gross floor area was 88 for general urban/suburban sites and 96 percent for the center city core and dense multi-use urban sites.

Time-of-day distribution data for this land use for a weekday, Saturday, and Sunday are presented in Appendix A. For the 16 general urban/suburban sites with data, the overall highest vehicle volumes during the AM and PM on a weekday were counted between 7:30 and 8:30 a.m. and 4:30 and 5:30 p.m., respectively.

For the three general urban/suburban sites with person trip data, the overall highest volumes during the AM and PM on a weekday were counted between 8:45 and 9:45 a.m. and 12:45 and 1:45 p.m., respectively. For the three dense multi-use urban sites with person trip data, the overall highest volumes during the AM and PM on a weekday were counted between 8:30 and 9:30 a.m. and 4:45 and 5:45 p.m., respectively. For the four center city core sites with person trip data, the overall highest volumes during the AM and PM on a weekday were counted between 9:00 and 10:00 a.m. and 12:45 and 1:45 p.m., respectively.

The average numbers of person trips per vehicle trip at the eight center city core sites at which both person trip and vehicle trip data were collected were as follows:

- 2.76 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 7 and 9 a.m.
- 2.90 during Weekday, AM Peak Hour of Generator
- 2.91 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 4 and 6 p.m.
- 3.02 during Weekday, PM Peak Hour of Generator

The average numbers of person trips per vehicle trip at the 18 dense multi-use urban sites at which both person trip and vehicle trip data were collected were as follows:

- 1.47 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 7 and 9 a.m.
- 1.47 during Weekday, AM Peak Hour of Generator
- 1.46 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 4 and 6 p.m.
- 1.53 during Weekday, PM Peak Hour of Generator

The average numbers of person trips per vehicle trip at the 23 general urban/suburban sites at which both person trip and vehicle trip data were collected were as follows:

- 1.30 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 7 and 9 a.m.
- 1.34 during Weekday, AM Peak Hour of Generator
- 1.32 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 4 and 6 p.m.
- 1.41 during Weekday, PM Peak Hour of Generator

The sites were surveyed in the 1980s, the 1990s, the 2000s, and the 2010s in Alberta (CAN), California, Colorado, Connecticut, Georgia, Illinois, Indiana, Kansas, Kentucky, Maine, Maryland, Michigan, Minnesota, Missouri, Montana, New Hampshire, New Jersey, New York, Pennsylvania, Texas, Utah, Virginia, and Washington.

Source Numbers

161, 175, 183, 184, 185, 207, 212, 217, 247, 253, 257, 260, 262, 273, 279, 297, 298, 300, 301, 302, 303, 304, 321, 322, 323, 324, 327, 404, 407, 408, 418, 419, 423, 562, 734, 850, 859, 862, 867, 869, 883, 884, 890, 891, 904, 940, 944, 946, 964, 965, 972

General Office Building
(710)

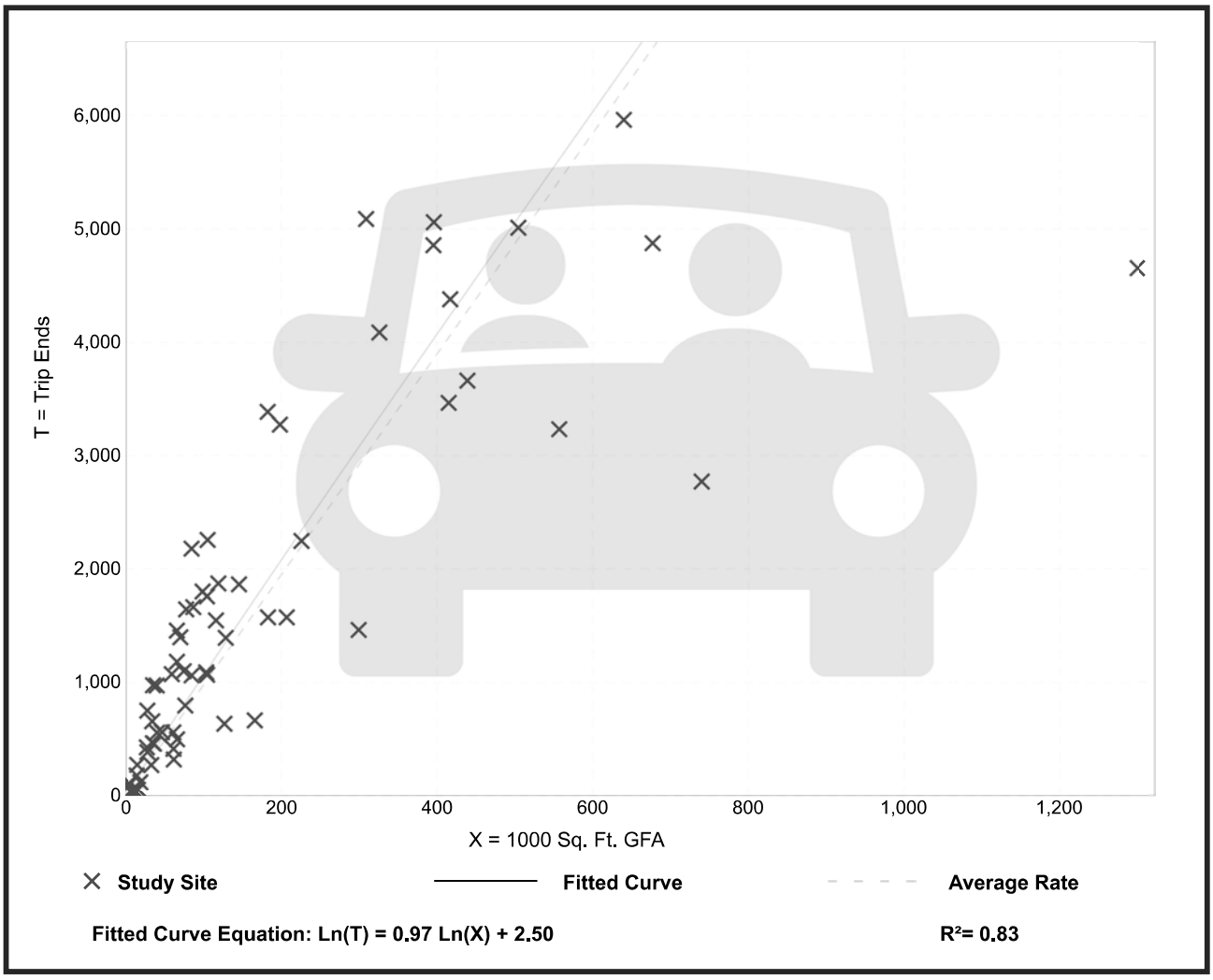
Vehicle Trip Ends vs: **1000 Sq. Ft. GFA**
On a: **Weekday**

Setting/Location: **General Urban/Suburban**
Number of Studies: 66
Avg. 1000 Sq. Ft. GFA: 171
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
9.74	2.71 - 27.56	5.15

Data Plot and Equation



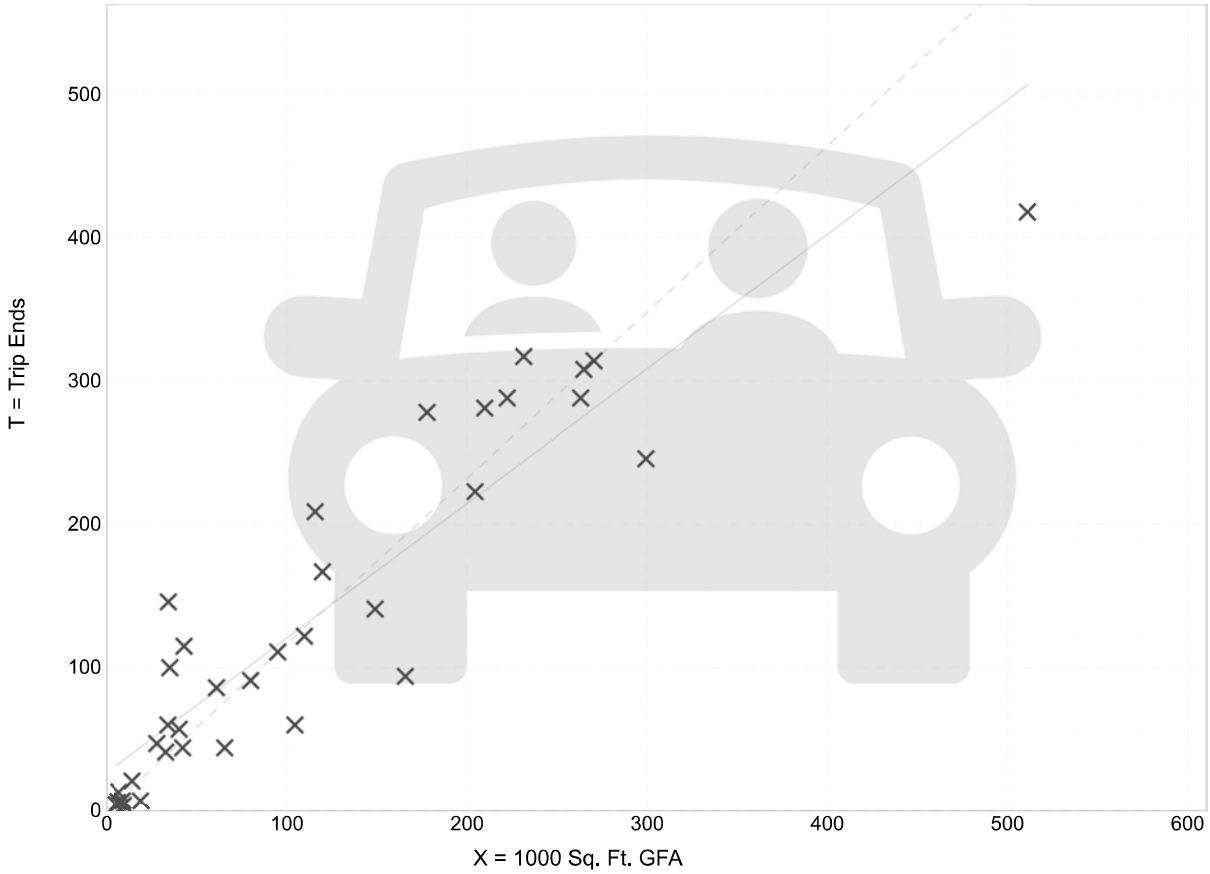
General Office Building
(710)

Vehicle Trip Ends vs: **1000 Sq. Ft. GFA**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 35
Avg. 1000 Sq. Ft. GFA: 117
Directional Distribution: 86% entering, 14% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
1.16	0.37 - 4.23	0.47

Data Plot and Equation



Fitted Curve Equation: T = 0.94(X) + 26.49

R^2= 0.85

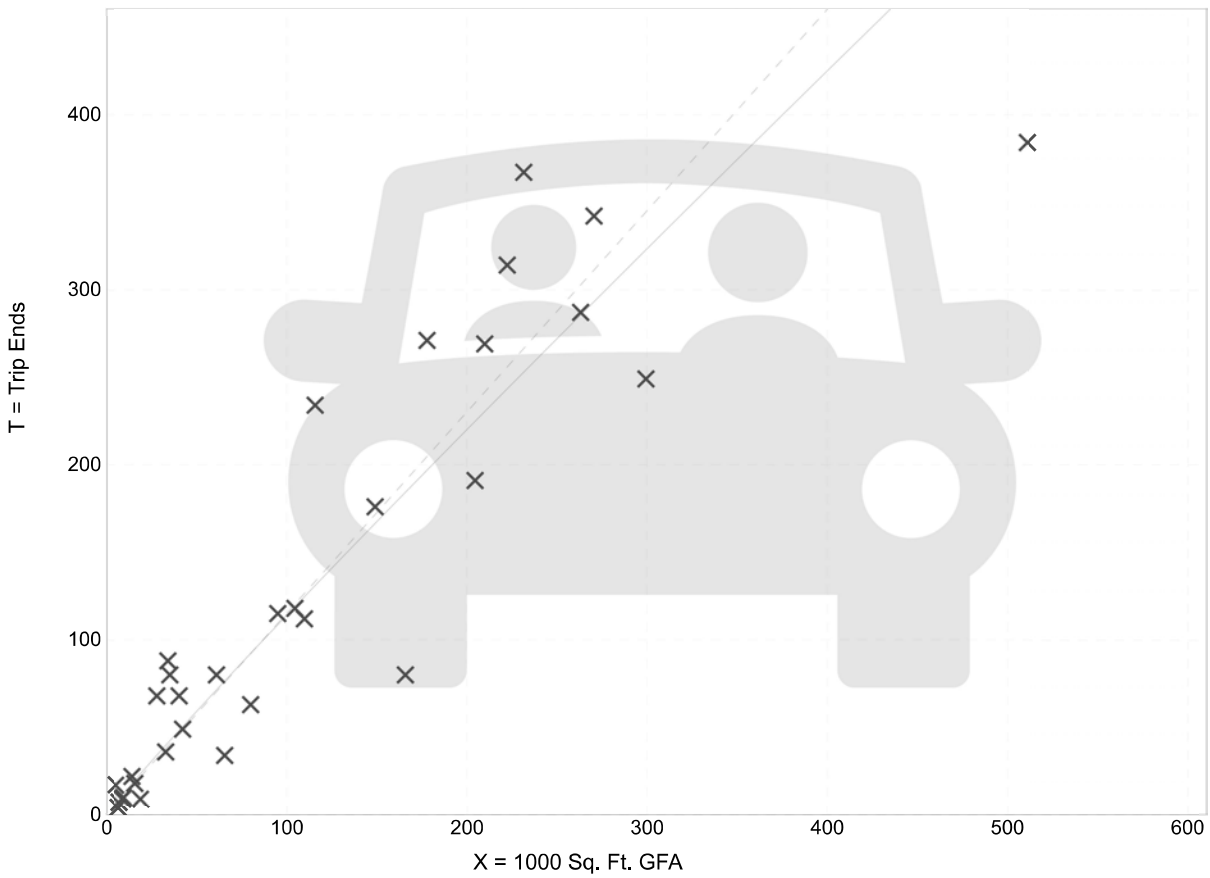
General Office Building
(710)

Vehicle Trip Ends vs: **1000 Sq. Ft. GFA**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 32
Avg. 1000 Sq. Ft. GFA: 114
Directional Distribution: 16% entering, 84% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
1.15	0.47 - 3.23	0.42

Data Plot and Equation



Fitted Curve Equation: Ln(T) = 0.95 Ln(X) + 0.36 **R^2= 0.88**

General Office Building
(710)

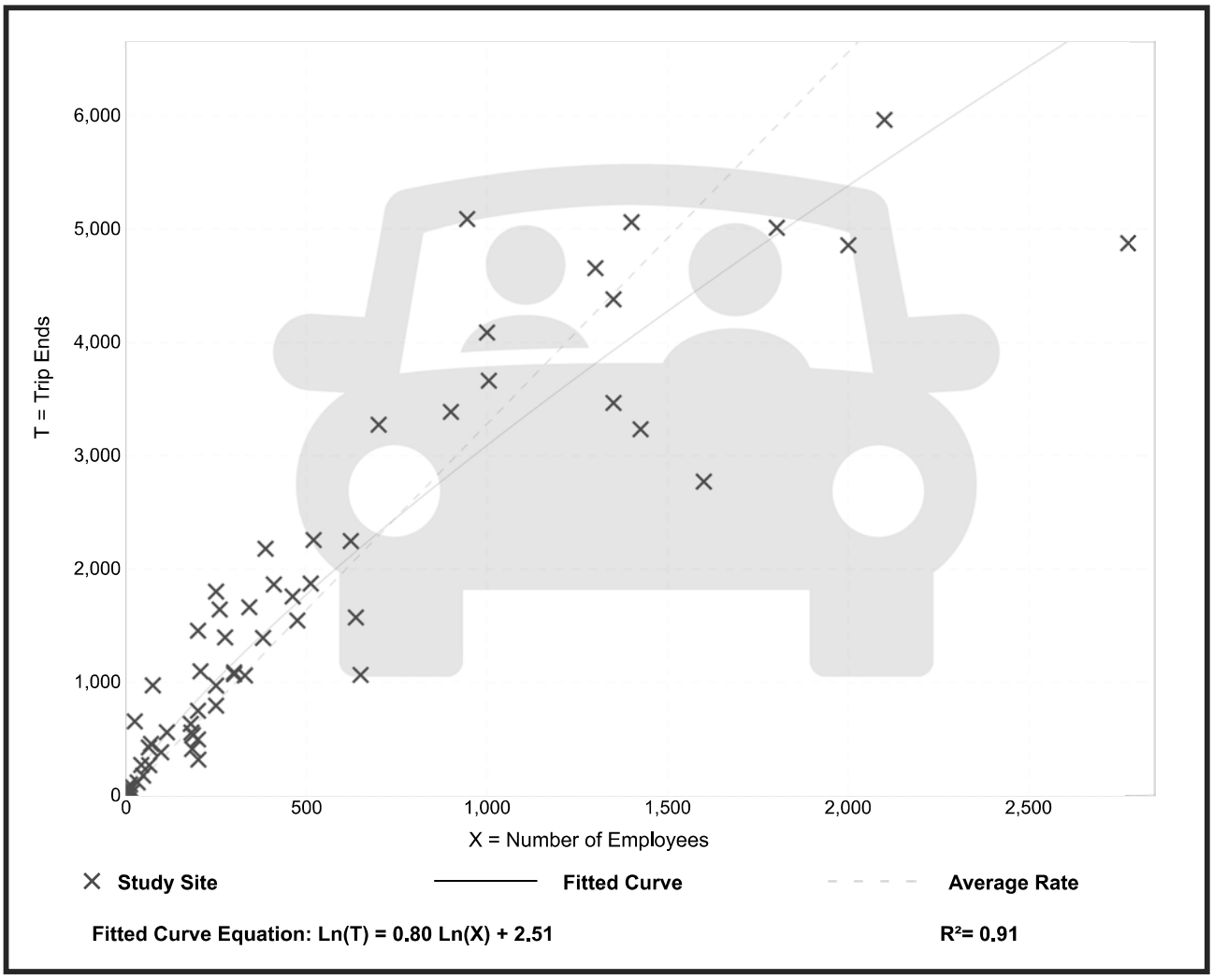
Vehicle Trip Ends vs: **Employees**
On a: **Weekday**

Setting/Location: **General Urban/Suburban**
Number of Studies: 60
Avg. Num. of Employees: 528
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
3.28	1.59 - 26.24	1.44

Data Plot and Equation



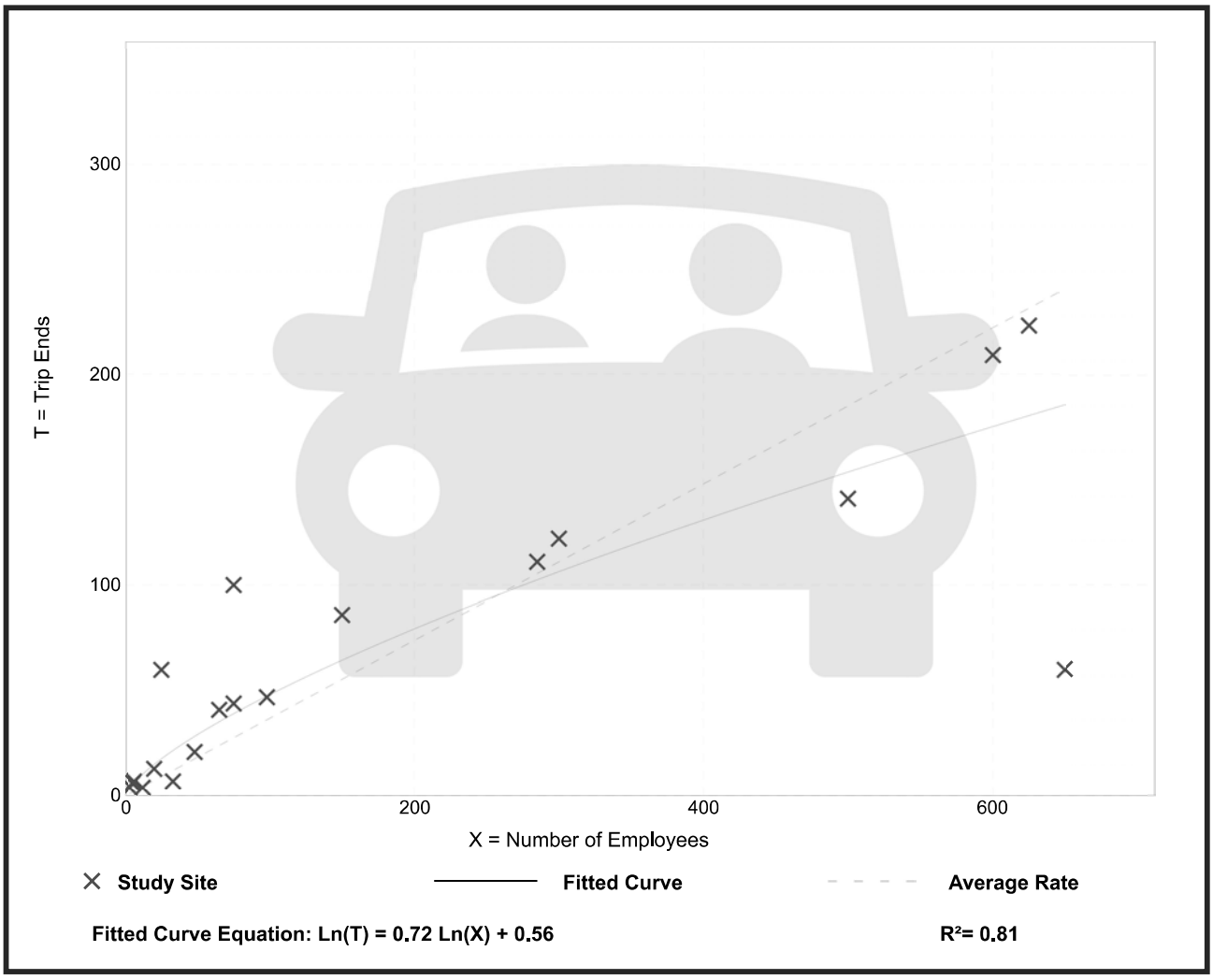
General Office Building
(710)

Vehicle Trip Ends vs: **Employees**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 19
Avg. Num. of Employees: 188
Directional Distribution: 83% entering, 17% exiting

Vehicle Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
0.37	0.09 - 2.40	0.27

Data Plot and Equation



General Office Building
(710)

Vehicle Trip Ends vs: **Employees**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 20
Avg. Num. of Employees: 179
Directional Distribution: 20% entering, 80% exiting

Vehicle Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
0.40	0.18 - 4.50	0.36

Data Plot and Equation